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ABSTRACT

This study explored the perspectives of teachers, administrators, and students as they were engaged in a 5-year funded project aimed at improving science and mathematics achievement for African American students in a school district. The study also discusses the obstacles that hindered and the supports that bolstered this project. In this study, race is at the center of the examination of science and mathematics achievement. Interviews were conducted with 27 secondary school teachers, 27 elementary school teachers, and 4 project administrators (also school district administrators). Twelve African American secondary school students were also interviewed. The perceptions of obstacles and supports were derived from the experiences of the co-principal investigator. As a result of the project, more African American students were enrolled in upper level mathematics and science classes and more received grades of "C" or better than previously. However, the number of these students remained extremely low. In many instances, teachers blamed the students' low achievement on their families or on previous teachers. Administrators were less likely to support this view, but some students agreed with teachers' emphasis on parental influence and responsibility. Those schools in which African Americans showed greater gains in mathematics and science had principals who were risk takers who supported teachers who wanted to alter their pedagogy. Principals of the effective schools were also able to confront and examine the racial disparities within their schools. The teachers in this study were increasing their focus on state standards and testing, a fact that that moved them further away from pedagogy that is relevant to any student, much less those of nondominant groups like African Americans. The school district suffers from many constraints that hamper efforts to increase student achievement, including low teacher salaries and inadequate funding, but it is to be hoped that another grant to improve mathematics and science may make the district able to consider some of the issues raised in this report. (SLD)

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Race at the Center: Perspectives on Improving Science and Math Achievement

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African American students comprise the largest minority group in a midwestern urban school district of approximately forty-five thousand students (Caucasian, 55.9%; African American, 31.2%; Hispanic American, 9.9%; Native American, 1.6%; Asian American, 1.4%). They are overrepresented in special education (37.8%) and underrepresented in college preparatory math and science classes, and advanced placement classes (9.7%). Their standardized and district criterion-referenced test scores are significantly below those of other racial groups. These trends are consistent with those found nationally (e.g., Clewell, Anderson & Thorpe, 1992; Oakes, 1990; Sable, 1998).

To address this disparity, a five-year Systemic Initiative Grant was implemented across grades K-12. It aimed to show teachers alternative classroom practices to better meet the needs of these students, and to provide academic support such as tutoring and summer programs for students. (There were also community and parent-based goals that are not the focus of this paper.) As a result, it was anticipated that more African American students would enroll in high-level math and science courses, and demonstrate improved grades and test scores. Accomplishing this goal would provide students with more opportunities for higher education and employment than would otherwise be available to them, thus addressing both social and economic justice.

Minority students' low achievement is often addressed from the perspective of a deficit model (Bartolomé, 1994), identifying what is wrong with the students and attempting to fix or remediate their problems. An alternative perspective is that certain groups are marginalized by society, a condition that is perpetuated in schools. This

marginalization is seen as the result, in part, of pedagogy that does not consider the cultural backgrounds of these groups (Ladson-Billings, 1995).

Critical pedagogy provides an expansive way to examine this disparity because it "…challenges us to recognize, engage, and critique (so as to transform) any existing undemocratic social practices and institutional structures that produce and sustain inequalities and oppressive social identities and relations" (Leistyna & Woodrum, 1996, p. 2).

The objectives of this paper are 1) to portray various perspectives of teachers, administrators, and students as they were engaged in a 5-year funded project aimed at improving science and math achievement for African American students; and 2) to discuss the obstacles that hindered and the supports that bolstered the goals of the project.

This paper discusses race and student achievement at a time when many institutions have ended affirmative action, believing that enough time has passed since "separate but equal" schools were ruled unconstitutional, thus no longer needing to address educational inequities. It is a time when our newly elected president is pushing for increased school accountability through yearly testing, threatening to remove federal funding if schools do not show acceptable levels of achievement.

In this paper, race is at the center of an examination of science and math achievement. In doing so, the intention is not to provide more data about unsuccessful African American students. This paper is not designed to bolster the stereotypical description of students of color that assumes that they are not smart enough or motivated enough to succeed in our educational system. Rather, the intention is to look at some of the complexities of education that are complicit in the low achievement of some groups

of students. Identifying and understanding these complexities may then contribute to research that shows how educators and educational systems can positively impact students who are often disenfranchised in our schools.

METHODOLOGY

Informants and data collection

The first author, a white university faculty member, interviewed samples of the various stakeholders to ascertain their perceptions about African American students' low achievement in math and science, and related issues. Twenty-seven secondary teachers, 27 elementary teachers, and 4 project administrators (who were also district administrators) were individually interviewed. Interviews were audiotaped and transcribed. Additionally, 12 secondary African American students were interviewed in groups of 2-3. Notes were taken during these latter interviews, which were elaborated and transcribed.

All informants were asked questions that were designed to ascertain their perceptions of African American student achievement in math and science. Teachers were also asked to describe how they taught math and/or science, and characteristics of successful and unsuccessful students in these content areas. Project administrators were also asked to talk about systemic issues related to the disparities between African American and all other students. Students were also asked about their achievement in math and science, and about characteristics of successful and unsuccessful students.

Analysis

These interview data were analyzed through the constant comparative method: transcripts from each group of informants were read multiple times to look for common themes. A common thread across many of the interviews was the locus of responsibility for student success in math and science. Within this major thread, several themes were identified and revised as necessary with each subsequent reading. They are described in the next section.

FINDINGS

Where does the responsibility for student success in math and science reside? Based on the analysis of the interview data, two major themes were identified that address this important question. One theme focuses on the responsibility of people – the parents, teachers, and students. The second major theme focuses on institutional factors. Each major theme is further categorized to make better sense of the data.

Responsibilities of People

Comments related to this theme showed how many of the informants described how specific people had major influences, if not complete responsibility, in student success.

1) Some informants identified others as having a prerequisite responsibility to their own responsibility toward student success. These others were parents and previous teachers.

2) Some informants identified the student as the responsible person for his or her success. This responsibility could be beyond the students' control through their innate abilities, or through students' (un)willingness to meet teachers' expectations.
3) Some informants identified teacher characteristics as an important factor in student achievement. These include teachers' attitudes toward students of color and their teaching styles.

Responsibilities of the Institution

1) Some informants talked about ways in which the players (usually teachers or counselors) in the educational system have low expectations for certain students. When these people were described collectively (i.e., "counselors do this" or "this is how teachers treat students) rather than identifying specific teachers, comments were classified in this category.
2) Institutional racism was another theme that describes some of the informants' explanations about disparate achievement. Included in this category were informants' comments about pervasive policies or assumptions about groups of children that had racial implications.

What informants said about African American low achievement: Responsibilities of People

Prerequisite responsibilities. It was not uncommon for teachers, especially those in the upper grades, to point to others as having primary responsibility for students' success. These "others" were usually parents and previous teachers.

Sometimes teachers frustratingly described what they saw as parents' lack of responsibility toward their children. For example, a white high school science teacher expressed his frustration about lack of parental support this way.

> There are two groups that aren't being held accountable: parents and kids. Now you and I raised our kids with certain expectations. "You will go to school. You will be there. You're not gonna miss many days of school, unless there is a situation. And I expect solid grades from whatever your academic level might be." And I'm sure that's how you raised your kids and I raised my own kids. And I don't see that. [Not just with African American kids, but] I've got all kinds of students that there is nothing coming from home and there are no expectations and the kid isn't being held accountable. (A-1, 3-15-97)

A white elementary teacher described why she thought these students were behind the others. Her comments equate readiness for school with typical experiences in white and middle/upper class homes.

> I think that people need to realize that when you are dealing with lower income, these kids don't come to school knowing their alphabet. They don't come to school with a lot of preschool backgrounds. They don't come from homes, not all of them, but a lot of them, don't come from homes where even the skills that you teach at school like the reason to learn to read or just reading for enjoyment with your family isn't enforced in the home. So when they come to school, they are behind. … I think from 0-2, if those kids are not given any kind of basis to learning or even to watch Sesame Street… You don't hear a lot about *Sesame*

Street or the more academic based programs. I think that is a key reason why [they are behind]. (I-7, 4-24-98)

It was not uncommon for teachers to put the major responsibility of student success on previous teachers. For example, a white high school physics teacher said,

> I think programs like [this one] are too little, too late, number one. You do not take a kid who in seventh grade has a third grade math level and tell a teacher, "You've gotta bring this kid up to snuff in chemistry," because the kid doesn't have the skills. . . What's happening is we're starting with kids way behind and not doing anything successful right at the start [in elementary school] to get them up to snuff. (A-2, 5-16-97)

Another teacher at this same high school expressed a common sentiment. This white chemistry teacher explained her frustration with the project.

> I think the theory is good, but for us to jump in when we have these kids now that are fifteen, sixteen years old, and all of a sudden we're going to work miracles and we're going to change their study skills? I know you can't give up and I don't want to give up on kids. What I'm saying is, I think that [this project] should be a project that grows and moves with the students. … We should, the district should concentrate on kindergarten, first and second graders at the most. … So that by the time we get them in high school, which is going to take awhile, they will be brought up by [this project] (A-3, 5-16-97).

District administrators rejected the perspective of some teachers that was just described. In a comment about teachers' complaints about poor student attendance and the implicit lack of parental responsibility, one project administrator said the following.

> The educator has a tendency to blame the parent. Attendance? "What are you [the teacher] personally doing about it? Have you ever isolated a student who has missed class twenty times and sat down and asked them why they missed class so much?" But then you'd have to want to know what your effect on the individual is. You would have to look at yourself as a possible reason [for his multiple absences] and most teachers are not willing to do that (J.G., 9-2-98).

Several high school students agreed with some teachers' emphasis on parental influence and responsibility. One ninth-grade girl explained why some African American students are unsuccessful: "Maybe they don't have people who care about them so they don't care." (S-08-04, 7-99) A tenth-grade girl said that some parents are not as encouraging as others, and that parents have a lot to do with how well their children do in school. Another tenth-grade girl believed that parents have "more impact than teachers." (S-09-06, 7-99)

Student responsibilities. Some teachers believed that the problem was that other educators saw the child as being primarily responsible for his or her lack of achievement. An African American high school math teacher explains,

> [A] lot of the staff doesn't buy into [the project]… [because] oh, … just that traditional racism… [I say that] because they're blaming the child for being behind. They're not blaming other things… The situation was there. I think it should be worked on to correct it and not try to put the blame on the child because they were born into the world as it is. But the problem is there. I think they should address it and try to help overcome it. It's like when you go to the doctor, you know, you see that you may have a broken leg. You don't say, "Well, if you

> hadn't done this or that you wouldn't have had a broken leg," but rather, you go and try to repair it and try to get beyond that instead of always saying, "if the child would do this and that." (A-4, 5-20-97)

Another African American high school teacher thinks that some African American students learn best from a particular kind of instruction because, "Most of them, I think they feel intimidated because most of their classmates and some of the staff, you know, not intentionally though, but they kinda like make them feel like they're slow." (C-3, 5-21-97)

In the following example, a fourth-grade African American teacher expresses her frustrations with other teachers who have low expectations of African American students. Believing in low expectations implies that these children have deficits that explain their low achievement. When teachers have this belief, they tend to water down their curriculum or deny the kind of instructional support to help students catch up with their peers.

> I have one student that went from like a 0 [percentile] in computation to a 39 percentile. …I think that there is something to be said when you have a student that had a test two years ago and her got a 0 [percentile] and here it is two years later and he has a 39 [percentile]. My question is, what happened to the grade [in school] in-between? What frustrates me a lot is when I read folders and it says this child has made no progress. As a classroom teacher, if I know he has made no progress, then I should be looking at what did I need to do differently because progress should be made by all students. (K-2, 5-14-98)

Some informants described students' sense of responsibility as a major factor in their success. A seventh-grade white science teacher describes student responsibility this way:

> [F]or the most it's the child['s responsibility], especially at this age. I'll tell my kids that, too. I say, "You're responsible enough to go shopping by yourself; you're responsible enough to baby sit someone, to take care of someone else's children; you are absolutely responsible for your grades. We can have your parents come in, we can work with your parent who takes away every privilege you have, and we can keep you after school. We can make you go to tutoring. When it comes down to it, you don't have to do anything until you decide that you're going to do it." (D-1, 5-23-97)

Students also talked about student responsibility. They described their peers who do not do well this way: "They just slack. They don't care about school or anything else." If they don't know, they should work it [math problems] out or ask someone. (S-10-09, 7-99) Other students described low achievers as those who do not pay attention or do not try. (S-10-08; 7-99) Others sleep, talk, or act "very ghetto." (S-09-03, 7-99) Those who succeeded said they asked questions when they did not understand, paid attention, and did the work. At home, some students had older siblings or parents they would call on for help in math. (S-10-07, 7-99)

Teachers' characteristics. Some informants described teachers who treated African American students differently than white students. For example, an African

American middle school counselor responded in the following way when asked why African American students are not as successful as other students in math and science.

> I think one of the big problems is that science and math are reflections of the overall attitude of the way people perceive our kids, African Americans. Two kids can be [doing] the same exact thing and nine times out of ten, the African American kid will be nailed for it. It is perceived that the African American kid had to be doing something wrong. That child doesn't have a chance from the get-go in that situation. (D-5, 6-5-97)

A male student confirmed this concern. "Some teachers give black kids more lip than white kids. Then black kids are more likely to get in trouble. Then the teachers expect them to be trouble makers." (S-10-12, 7-99)

Students often described teachers' style of teaching as a major factor in their success. They rarely identified the subject, either the level of math (algebra or geometry, for example) or the specific science course (such as chemistry or biology) as having a major impact on their success. Rather, it was the way in which teachers engaged them. A group of girls explained that they did not like biology because they did not do anything in class but take notes and tests, leading to boredom. The teacher did not connect biology with the students. (S-08-04, 7-99) A group of boys described teachers who gave up on them: "Sometimes it's bad teachers. They don't try to help students understand." These teachers "give up on students." (S-10-11, 7-99) Another complaint was the overuse of worksheets. (S-10-12, 7-99)

Students who liked science or math described teachers who "put science always in the world." Science, they said, "doesn't connect until the teacher expands it." (S-09-06,

7-99) One of the male students said that teachers need to "talk about how subjects relate to kids better." Like when discussing "ions, how does this relate?" Teachers need to have more projects so students can "read to understand and put ideas in their own words. That's better than worksheets." (S-10-11, 7-99)

Students frequently pointed to teachers' respect toward them as a major factor in their success. One high school boy stated, "At [my junior high], the teachers showed more respect. They made sure we understood." (S-10-10, 7-99)

What informants said about African American low achievement: Responsibilities of the Institution

Systematic perpetuation of low expectations for students of color by individuals. Sometimes counselors participated in procedures that disenfranchised African American students. An elementary teacher described what happened to one of her former African American students upon reaching high school.

> One of my former students that was in senior high school said to me that they discouraged [her] from taking the higher levels of math and science; not the teacher, the counselor. … because the counselor didn't think that this child was college material. This child was placed in … a general science class, rather than biology or chemistry. … The parent had to go up and talk, the parent went up and talked to the counselor and told them that my child is going to college and they wanted their classes that they were placed in to be classes that they would need for college. (I-I, 4-27-98)

One girl explained low African American achievement by saying that when students hear so often that they cannot do the work, they begin to believe it. Another

student, meeting with me in another group, voiced a similar belief. "If people say they can't do something, then they stop and don't try." (S-08-05, 7-99)

One tenth grade student believed that she had the same education as white students. However, she described her cousin's experiences quite differently. When her cousin received an A on a test, the teacher accused her of cheating. "The teacher was kind of racist." (S-10-07, 7-99) Another girl (S-10-08, 7-99) in the same class also thought that her experiences had been positive, but that there were some teachers who are like those of the past who mistreated black students. The third girl in this group explained African American students' low success rate in the following way. When people "see a black person do well, they think something is wrong with them." (S-10-09, 7-99)

Institutional racism. There were some informants who talked about the institution of education perpetuated racist practices. As one white administrator told me, "You don't see institutional racism happening. It's like a cancer and it's difficult to indicate to people that they are ill" (J.G., 9-2-98).

Another white administrator focused on the complexity of improving achievement of students who historically and currently do not demonstrate as much school success as white students.

> It's an extremely complicated problem. Obviously, looking across the country, it's been very difficult for school districts to deal with. There are very few school districts that have improved African American or Hispanic achievement. There are some schools that have done it fairly well. The problem is like an onion; there are many forces working on African American students. Sometimes our staff

> tries to simplify the issue into, "Well, if the kids would only do what I tell them do so," or, "If the parents would provide support, everything would be fine." (R.M., 7-21-98)

This same administrator went on to describe how schools and teachers do not want to address the special needs of students. "Much of the time I think this is institutional racism."

Reflections about the "Big Picture"

The second author, an African American woman, was released half time from her university teaching duties to serve as co-principal investigator of the project. In this capacity, she was responsible for keeping the broad goals of the project at the forefront of the efforts of the district, building administrators and teachers as they attempted to improve student achievement. Her perceptions of both school-level obstacles and supports that impacted this project follow.

As a result of this project more African American students were enrolled in upper level math and science, supported, and received grades of C or better than previously. However, the number of these students was extremely low. The staff often became frustrated with teachers and principals who did not understand that this project was more than just about teaching African American students. Rather, it was about ways in which to treat and teach *all* students. Creating classrooms that provided support for struggling students and, related to this, showed connections between science and math and students' lives would benefit all students.

Though not unique to this district, many teachers were unwilling to examine their own teaching, especially within the context of race-based differences. If one examines

their own attitudes and teaching practices as ineffective for students of color, they may be concerned about being labeled racist.

Adminstrators' view of their jobs also impacted the attitude of teachers in their schools and therefore the success of students. For example, some principals saw this grant merely as an opportunity to buy some materials for their science or math classes. Teachers in these schools were not encouraged by their administrators to reflect on their teaching. Some of these ineffective (for African American students) schools were in neighborhoods that had experienced demographic changes that resulted in increased percentages of African American students.

Schools in which African American students showed greater gains in math and science had principals who were risk-takers. These principals supported teachers who wanted to alter their pedagogy. They were principals who believed that teachers could adhere to district and state standards in ways that were responsive to the students in their classrooms. They were also aware of what was occurring in classrooms, a characteristic not found in principals of ineffective schools.

Principals of effective schools were also able to confront and examine the racial disparities within their schools. Other principals seemed to not want to say that term, much less examine it. Some of this latter group, especially those in elementary schools, thought their schools were successful when students felt better about themselves. Though self-pride certainly affects academic performance, a focus on nurture while excluding high expectations and supports to achieve those high levels is condescending (Delpit, 1995).

SIGNIFICANCE

This is a time when politicians loudly proclaim what is wrong with schools as they offer simplistic solutions. Education is a complex process that is embedded within the social structure of our nation and communities. It is not enough to say "have high expectations of everyone" or "hold schools accountable," though these two notions are part of the solution.

Some of the project administrators, school administrators, and teachers understood, in varying degrees, how educational systems sometimes marginalized students through undemocratic processes; others demonstrated opposite beliefs and understandings about effective educational change. For some, the project was designed to integrate low achieving students into an existing system without questioning the basic premises upon which that system operates. Others had a better understanding of the transformative changes required to make a significant impact on students' achievement. As Freire (1993) tells us, "The solution is not to 'integrate' them into the structure of oppression, but to transform that structure so that they can become 'beings for themselves'" (p. 55).

These students were not suddenly marginalized by schools, however. Our society has a history of marginalizing students of color. The Supreme Court outlawed separate but equal schools within the last 50 years. Though it is true that more and better education affects employment possibilities, whites are more likely to get hired and to get hired in better-paying jobs than African Americans with similar or more education (Mickelson, Smith, & Oliver, 1993; Sable, 1998). In fact, white male high school drop-

outs make more money, on average, than black males with high school diplomas (Sable, 1998).

There is also research that shows what is effective education for students of color. This is the type of education based on culturally relevant pedagogy. Culturally relevant pedagogy (Ladson-Billings, 1995) has three purposes: 1) "to develop students academically," 2) "to nurture and support cultural competence" (p. 483) (i.e., to affirm African American students' modes of dress, language and patterns of interactions), and 3) to develop students who can both understand and critique the existing social order" (p. 474).

Teachers in the schools described in this paper are increasing their focus on state standards and testing. This moves them farther away from pedagogy that is relevant to any student, much less those of non-dominant groups like African Americans. Teaching to the test requires teachers to discard learning opportunities that encourage engagement and problem solving, replacing them with rote learning. Though certainly many teachers were already using this type of behaviorist teaching, low achievement, especially by marginalized students, is testimony to the failure of such pedagogy.

This district is also affected by state policies governing school funding. Though it has the highest number of children of color, immigrant children, poor children, and children with special needs, it spends less per student than other school districts in the same city. This is a result of several factors. White flight from the inner city and its resultant devaluation of property is certainly an important factor. But another is propagated by the state government. The funding formula used for state aid prevents this district from collecting enough money to equitably serve its unique population and

prevents it from spending all the money it does collect. A recent attempt to have the state legislature change its funding law was unsuccessful.

There is also the factor of teacher salary. Teacher salaries in this district and state are among the lowest in the country. Again, because of school funding restrictions, teacher salaries are also affected. At the writing of this paper, there are twenty science and math teacher vacancies.

The district has recently received another grant to improve math and science achievement for all students. It is hoped that, within their budgetary constraints and lack of needed science and math teachers, it will be able to consider some of the complexities revealed in this research.

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